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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/686,031 | 10/14/2003 | Heidi Cao | 10559-867001/P17315 | 4967 |

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| EXAMINER | |
|---|---|
| WALKE, AMANDA C | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1795 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| | | | |
|---|---|---|---|
| ***Office Action Summary*** | **Application No.**<br>10/686,031 | **Applicant(s)**<br>CAO ET AL. | |
| | **Examiner**<br>Amanda C. Walke | **Art Unit**<br>1795 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *31 January 2008*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-27 and 31-35* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☒ Claim(s) *34 and 35* is/are allowed.
6)☒ Claim(s) *1-9,11,13-27 and 31-33* is/are rejected.
7)☒ Claim(s) *10 and 12* is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 21-24 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoon et al (JP 2002-082441 in view of its English language machine translation).

Yoon et al disclose a resist comprising a lactone in the backbone, that may be a 5 or 6 membered ring, and, as exemplified on pages 9, 15, 20, and 21, comprises a tertiary carbon attached to the lactone carbonyl oxygen. This substituent may be a cage group, carbonyl, H, alkyl, hydroxyalkyl, or ester group. The material is UV sensitive.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-9, 11, 13-18, 20, 25-27, 31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al in view of Fedynyshyn (6,680,157).

Yoon et al has been discussed above, and teaches that additional monomers may be employed in the resin. Additionally, the material is UV sensitive, and any suitable method may be employed.

Fedynyshyn discloses a resist composition of EUV or electron beam exposure similar to that instantly claimed. The reference teaches that additional suitable monomers include hydroxystyrene. The reference also teaches that suitable exposure methods for such compositions are those EUV exposures in a vacuum environment as it aids to control outgassing.

Given the teachings of the references, it would have been obvious to one of ordinary skill in the art to prepare the material of Yoon et al choosing to add the advantageous PHS monomer to the composition and also to choose to expose the material and form a pattern in a vacuum environment with reasonable expectation of achieving a pattern having reduced edge roughness.

### *Allowable Subject Matter*

5. Claims 10 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to teach or suggest a lactone monomer comprising the instantly claimed substituents.

6. The following is a statement of reasons for the indication of allowable subject matter: Claims 34 and 35 are indicated as containing allowable subject matter as the prior art of record fails to teach or suggest a lactone monomer comprising the instantly claimed substituents.

### *Response to Arguments*

7. Applicant's arguments filed 1/31/2008 have been fully considered but they are not persuasive. Applicant has again argued that the lactones in the backbone of the references of record will not undergo a ring-opening reaction upon semiconductor processing (i.e.

development). However, it is well known that lactone compounds will undergo such a reaction as these compounds are known development inhibitors, and inhibit development by reacting with the developing solution to undergo a ring opening reaction. One reference which discusses this is Maemoto et al US 2004/0101780 in the second column of page 16, but this reference is not relied upon for any rejection, just as an example of the many references which demonstrate that it is well known that lactones perform in this manner. Applicant has argued that it is the side chains of the (meth)acrylic monomers of the polymers of Yoon that will react to the acid and be cleaved instead of the lactone reacting and undergoing a ring-opening reaction. The examiner notes that the material of Yoon does include an acid generator similar to the material of the instant invention ([0085]) in addition to the similar monomers/ polymers. Furthermore, in many examples, the ratio of lactone monomers in the resultant polymer is greater than that of the methacrylic monomers. Given that the lactones are present in the photoresist, it is expected that some percentage of lactone monomers will undergo ring opening reactions along with the cleaving of the side chains of the additional monomers. Applicant has not persuasively demonstrated that none of the lactones in the material of Yoon (comprising a similar polymer, similar acid generator, and being employed in a process having the same coating, exposure, and development steps as the instant invention) will react with the photoacid generator present in Yoon's material. Furthermore, the Yoon reference teaches lactones in the polymer backbone meeting the instant claims in combination with monomer such as maleic anhydride, and no (meth)acrylate monomers, thus it appears that it would be the lactone reacting in that instance. It is noted that while the applicant is arguing that the mechanism would be different, the claims simply require that there be present a lactone as described in the instant claims in the polymer backbone, and now, additionally a styrene. Therefore, the examiner maintains her position that the lactone compounds in the backbone of the Yoon et al resin will inherently undergo a ring opening reaction upon semiconductor processing, and the rejections of record are maintained.

Additionally applicant has again argued that the Yoon reference fails to teach the solubility switching of the photoresist in developer. In semiconductor processing, it is typical for a photoresist layer to be aqueous soluble until exposed to light, usually through a mask, which cause the solubility of the portions of that layer to become more or less soluble to aqueous solution (i.e. developing solutions). This is standard, and how a resist pattern is formed. Regardless of whether or not the Yoon et al reference discusses this in depth, it is clearly contemplated and taught by the reference in its specification when discussing coating, exposure, and development. Also, given the close similarity of the materials and methods, one of ordinary skill in the art would expect this solubility switch, and according to the MPEP:

The prima facie case of obviousness is not undermined simply because applicant's motivation differs from the prior art's motivation. In re Dillon, 919 F.2d 688, 692-93, 16 USPQ2d 1897, 1901 ( Fed. Cir. 1990) ( in banc ), cert. Denied, 500 U.S. 904 (1991).

Applicant has also argued that the Yoon reference failed to teach the presence of a styrene, and that the Fednyshyn reference teaches away from the instant invention, and that the examiner has erred by stating that the Fednyshyn reference may be relied upon for some teachings of conventional additives or methods instead of taking the reference’s teachings as a whole. The examiner has stated that the Fednyshyn reference is solely cited for its teaching that styrenes are common co-monomers with maelic anhydrides, acrylates and methacrylates, and for its teaching that it is known to expose EUV resists in a vacuum, not for its complete polymer. The Yoon reference teaches that any common co-monomers may be included and teaches that (meth)acrylates are preferred, thus it would have been obvious to one of ordinary skill in the art to prepare the material of Yoon adding a (meth)acrylate and/ or common co-monomers, therefore that argument is unpersuasive. In light of the teachings of the references, the rejections of record are maintained.

Finally, the examiner may look to a reference for a teaching of a conventional feature such as types of co-monomers, additives, and/ or conventional and beneficial steps such as performing the UV exposure in a vacuum rather than not. As discussed above, the reference demonstrates clearly that it is well know in the art to employ styrenes in combination with maelic anhydride monomers giving one of ordinary skill in the art motivation to employ that combination, as well as the perform the EUV exposure of the material of Yoon in a vacuum as it is well known that the EUV exposure step of a method may be performed in a vacuum *on any EUV sensitive material and not solely the material of Fednyshyn.* Therefore, the examiner's reliance on the teachings of well known variations of exposure steps and known combinations of monomers is appropriate and the rejection is maintained.

## ***Conclusion***

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C. Walke whose telephone number is 571-272-1337. The examiner can normally be reached on M-R 5:30-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Amanda C Walke
Primary Examiner
Art Unit 1795

/Amanda C Walke/
Primary Examiner, Art Unit 1795
4/27/2008

| **Application Number** | **Application/Control No.**<br>10/686,031 | **Applicant(s)/Patent under Reexamination**<br>CAO ET AL. | |
|---|---|---|---|
| | **Examiner**<br>Amanda C. Walke | **Art Unit**<br>1795 | |